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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/373,544	08/13/1999	HIROSHI NAKATSU	829-522	2693

23117 7590 08/07/2003
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EXAMINER

KANG, DONGHEE

ART UNIT PAPER NUMBER

2811

DATE MAILED: 08/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/373,544

Applicant(s)

NAKATSU ET AL.

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4 and 11-16 is/are rejected.
- 7) ☒ Claim(s) 2 and 5-10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Acknowledgment

1. Applicant's Response to paper No.17 has been entered and made of Record (Paper No.18). Claims 1-16 are pending in this instant application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims **11, 14, & 15** are rejected under 35 U.S.C. 102(e) as being anticipated by Hosoba (US 5,814,839).

Hosoba teaches a light emitting diode comprising (Fig.1A):

a semiconductor substrate (1); a layered structure (110) comprising an AlGaInP type compound semiconductor material and provided on the semiconductor substrate, wherein the substrate is inclined in a [011] direction with respect to a (100) plane (Col.9, lines 57-59),

wherein the layered structure composed of a pair of cladding layers (2 & 4) and an active layer (3) for emitting light provided between the pair of cladding layers; and a current diffusion layer (6) comprising an AlGaInP type material (Col.19, line1-Col.21, line 31). Hosoba does not expressly teach the current diffusion layer is lattice mismatch with the light emitting structure. However, Hosoba teaches the current diffusion layer

having a different composition with the light emitting structure (Col.21, lines 44-47). This gives a lattice-mismatch between the current diffusion layer and light-emitting layer because of a different composition of Al and/or In.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims **1, 3-4 & 12-13 & 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosoba (US 5,814,839).

Regarding claim **1 & 12-13 & 16**, Hosoba teaches a light emitting diode comprising (Fig.1A):

a semiconductor substrate (1); a layered structure (110) comprising an AlGaInP type compound semiconductor material and provided on the semiconductor substrate, wherein the substrate is inclined in a [011] direction with respect to a (100) plane, wherein the layered structure composed of a pair of cladding layers (2 & 4) and an active layer (3) for emitting light provided between the pair of cladding layers; and a current diffusion layer (6) comprising an AlGaInP type material (Col.39, line 45-Col.41, line 4).

Hosoba does not expressly teach the current diffusion layer is lattice mismatch with the light emitting structure, wherein the lattice mismatch is -1% or smaller. Note that the conductivity of AlGaInP compound layer can be changed with varying a

composition of Al and/or In. Hosoba teaches the current diffusion layer having a different composition with the light emitting structure (Col.21, lines 44-47). This gives a lattice-mismatch between the current diffusion layer and light-emitting layer because of a different composition of Al and/or In. The lattice-mismatch causes a high dislocation density and the dislocation degrades the optical properties of the device. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the lattice mismatch of the current diffusion layer with respect to the light-emitting structure in order to prohibit a high dislocation density which degrades an optical properties.

Regarding claim 3, Hosoba teaches a composition of the current diffusion layer selected in such a manner that the current diffusion layer becomes transparent with respect to a wavelength of light emitted from the light-emitting structure.

Regarding claim 4, Hosoba teaches a composition of the current diffusion layer is expressed as $(\text{Al}_x\text{Ga}_{1-x})_{1-y}\text{In}_y\text{P}$, and x is set in the range of 0 to 1 and y is set in the range of 0 to 1 in the composition, which are in the claimed range.

Allowable Subject Matter

6. Claims 2 & 5-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Hosoba teaches AlGaInP current diffusion layer formed on the light emitting structure which comprises an AlGaInP material, wherein the current diffusion layer is lattice-mismatched with the light-emitting layer because the current diffusion layer of

Hosoba has a different composition with the light emitting structure. However, Hosoba fails to teach or suggest the semiconductor substrate is inclined by 8° to 20° in a [110] direction with respect to a (100) plane thereof.

Hosoba also fails to teach a composition of the current diffusion layer expressed as $(\text{Al}_x\text{Ga}_{1-x})\text{In}_{1-y}\text{P}$, and at least one of a value of x and a value of $1-y$ in the composition decreases in a step-like manner along a thickness direction of the layered structure from an interface with the light emitting structure toward opposite end of the current diffusion layer.

Response to Arguments

7. Applicant's arguments filed June 19, 2003 have been fully considered but they are not persuasive. Applicant argues that Hosoba discloses "the current diffusion layer is lattice-matched with the substrate (Col.12, lines 46-53). This is not convincing. Hosoba teaches the current diffusion layer, which is lattice matched with the substrate, is made of AlGaAs but not AlGaInP .

In Hosoba, the current diffusion layer has a different composition of Al and/or In with that of the light emitting structure (Col.21, lines 44-47). This gives a lattice-mismatch between the current diffusion layer and light-emitting layer.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

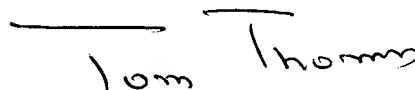
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 703-305-9147. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

dhk
July 28, 2003